

PAUL HAIT AND THE DENTAL UNIT

"What!" said George, the President of the Company, "you don't think we've got a viable product!" "That's right, I don't think you've got a product" I said. "But we've already put a hundred thousand dollars into this project and we're going to build this thing." "I still don't think you've got a product" I repeated.

A little more than three months before this conversation, Paul Hait had been tucked away safely in the womb of Technology Inc., a large San Francisco Bay area corporation. During the six years since obtaining his engineering degree, he had risen with the corporation to an engineering management position. He had become dissatisfied with the large corporation and found himself getting impatient with the corporate life and the way time was passing. This is the way he tells the story of his "brutal" introduction to "entrepreneurship".

The assistance of Mr. Paul Hait is gratefully acknowledged. Names other than Paul Hait are fictitious.

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Basically, I'm the type person who wants to do "his own thing". I have a desire to create my own company from scratch, to start from the ground floor and build a solid corporate structure. Consequently, when I was approached by Mike Morgan, who represented John Wilson, a local venture capitalist, with a proposal for starting up a new company, I was interested. Here was the opportunity I had been looking for, a chance to build a company from scratch, to make the transition from a large corporation to a small company -- and here was someone willing to finance this opportunity.

After my conversation with Morgan I decided to contact Wilson directly. At the interview Wilson was concerned mostly with how I would handle myself in certain "people situations". Apparently, he was already satisfied with what he had learned about my technical background. At the end of the interview he asked me to decide what it would take to get me to leave Technology Inc. and come to work for him.

Within three days I put my terms to Wilson. I requested two things: a slight increase in salary, and time to critically review and evaluate the proposed product to determine if it was a sound proposition. The latter was especially important because the product was in the medical-dental field which was unfamiliar to me.

The product was a "revolutionary" dental chair unit (Exhibits 1 and 2). It was the brainchild of Dr. Bill Walker, a local dentist, who was a personal friend of Wilson. Dr. Walker had been working on his idea for twelve years. After many stops and starts he had got together with two friends, an industrial designer, Cole Mantle, and a young electrical-mechanical engineer, Karl Match, and had built a prototype of the dental unit (Exhibit 3).

Once the prototype was built, Dr. Walker realized that he would need a larger source of capital than he could personally raise to get his design into production. Therefore, Dr. Walker had approached his friend, John Wilson, about investing in the project. After briefly reviewing Dr. Walker's design concept, Wilson agreed to invest in his friend's project.

In the agreement it was stipulated that Wilson would be allowed to pick the manager of marketing who would be president of the company, and the manager of engineering who would be a creative development engineer. It was for the second position that Wilson had contacted me. Dr. Walker was named chairman of the board and was given 40% of the stock in the company for his patents on the chair.

A few days after I submitted my proposal to Mr. Wilson he contacted me and asked me to come to work for him. I went to Technology Inc. and told them about my intention to leave. They tried to persuade me to stay and offered to increase my salary.

I decided to leave for four basic reasons: 1. I had set a goal for myself of becoming a millionaire at the age of 35. This would be impossible in a large corporation. 2. I wanted to own my own business. I was being offered an opportunity to experience the transition from the large corporation to a small business, of building a small business from the ground floor with someone else taking the financial risk. 3. The venture capitalist, Wilson, was very highly recommended by people I had contacted. 4. I would have a freedom of action I had never had at Technology Inc. That is, I would be able to make decisions on all aspects of the business.

Thus, I found myself in the small office of Walker Dental Supplies Inc. with only a second-hand desk and chair. There was a small shop in back with a few tools. It was my responsibility to take the prototype and develop it into a full-fledged marketable item.

In the office there were already three other people: Dr. Walker and his two consultants, Mantle, the industrial designer, and Match, the engineer. The situation at this point was that there were those three friends who had been working on the chair, and now I was thrust in to be in charge of the engineering and they didn't know me from Adam. This situation was difficult. The two consultants did not accept me as their new leader. This soon led to conflict between myself and the group. This hampered the company's engineering productivity considerably. Both the industrial designer and the engineer were very uncompromising and strong willed.

The engineer was what I call an "iterative" engineer. He never knew when to stop engineering something and build it. He was always thinking about why something wouldn't work. In my opinion he spent 90% of his time talking and only 10% doing. This was in direct conflict with my philosophy. I like to consider all the reasons why something can be done and then do it. I believe you need to build something, even though it may be a poor job, because once you have built it you have something physical which can be criticized and changed. Thus you can do a good job by correcting its engineering weaknesses. It's getting that first physical something to criticize that's the problem. In fact, one of the reasons I accepted the job without trying to run a check on the proposed dental unit, was that

I knew that there was a physical prototype which could be criticized. The idea of criticizing the prototype bothered Dr. Walker. He took it as a personal insult that I wanted to criticize "his dental unit".

As the weeks passed the working situation began to deteriorate substantially. The other members of the team would not come to meetings when I called them. They would meet behind my back and change some of the design features and then say they were unable to get hold of me.

Because of the difficulty with members of the group I hired a designer, Harry Anderson, part time, who began to do a layout of the prototype on paper. We also began to test certain proposed design features of the unit to determine their feasibility. One of the major design conflicts within the group was that I favored a hydraulic lift mechanism and the other two consultants favored a mechanical gear-driven system.

After two months of unsuccessfully attempting to work with Walker's consultants, I decided to let them follow whatever design paths they wanted. For myself, I decided that I needed to find out what the dental market wanted. I figured that I couldn't act from a position of strength unless I had the opinions of a number of dentists. Right then, the only dental opinion we had was Dr. Walker's. Since he invented it, he thought it was the greatest unit in the world and he didn't need any other dentists' opinions.

My investigations soon turned up some extremely interesting facts. When I was originally contacted about the job I had been told that there were only five or six companies in the business. However, I found twenty-six dental chair companies. This meant that there was more competition than I had originally anticipated. By reading through dental magazines, I determined that had Dr. Walker's idea been built twelve years earlier, it would have been truly revolutionary. However, it would have been impossible to build then because the technology did not exist.

Dr. Walker had recognized that a dental unit needed to be as flexible as possible. It had to work for all the different types of patients. Added to this, each dentist is different and so is his assistant. Therefore, he had proposed that his chair be extremely adaptable, in essence, that it attempt to be all things to all people.

From a theoretical standpoint it was a very interesting concept. In fact, it was this concept that had won over John Wilson, the venture capitalist, when he decided to invest his money in the

company. However, no one had considered the feasibility of actually building such a chair in a production situation. No one had thought to consider the tooling cost, the stocking problems, inventory, etc. Basically, to be all things to all people is pretty expensive and very difficult to design for.

Dr. Walker was trying to maintain as much control as possible on his unit. He saw me as a threat to the identity of his product. He was afraid that if I was a creative engineer, everyone would start calling the unit "Paul's unit" rather than "Bill's unit".

When I first came to the company John Wilson had purchased a cabinet business and added it to the firm. Once its product line was redesigned it was to provide a cash flow for the company during the chair development program. A new building was leased to house the cabinet business and the development of the chair under one roof. Everything had to be moved into the newly leased plant. With the cabinet business came a lot of old tools. I ended up having to sell many of the tools which were in bad shape in order to get money to buy the basic equipment for a small machine shop, which was needed for the chair development program.

During this time, I began making the rounds with a model of the prototype, showing it to other dentists. I noticed that I couldn't get any agreement among the dentists. I found that all the dentists had heard of the chair because Dr. Walker had spoken of it at a number of dental shows over the years. No one was willing to pay the price for such a chair. Besides that, they didn't think it was flexible enough. To my great interest, I found that almost every dentist was working on his own "ideal" dental unit. In fact, many of them actually had prototypes constructed in backrooms of their dental offices. I noticed that each dentist's unit was perfect for the dentist who had designed it, but wasn't suitable for dentists in general. I noted that a number of them did have specific elements which were outstanding. This led me to the idea of breaking the dental unit system into elements composed of the best of the features I had seen.

Besides dentists, various other people contributed ideas for a new design, including myself and a friend in Oregon who suggested cantilevering the chair. I also visited a dental show looking for new ideas and to see if anyone had anything similar to Dr. Walker's unit.

I decided to show my collection of individual "best elements" to a number of dentists to get their opinions. This time I

did get a certain agreement in favor of the elements. Next, I considered the possibility of putting all of these "best elements" together into a unit. I began to compare this package of "best elements" against Dr. Walker's dental unit.

Meanwhile, the designer I had hired and I had been running test and cost estimates on the original prototype. Thus, three months into the program, we came to the conclusion that Dr. Walker's design was not practical for the following reasons:

1. It was an all or nothing design, no modularity and no spin off elements.
2. Excessive tooling cost. Too many cast and formed parts.
3. High manufacturing cost due to mechanical and electrical complexity.
4. Difficult and unsolved packaging problems would require a great deal of money and time to answer.
5. Unreasonable noise problems with existing standard hardware and power trains.
6. Sales features were being obscured by design restrictions.
7. Obvious purchasing and production control problems due to the large number of specialized parts - both mechanical and electrical.

All of these could spell disaster for the product if not adequately solved.

It was at this point that George Hack, president of the company, called me into his office to ask me about investing my money in the company. I was scheduled to invest \$6500 for 6-1/2% of the company and was told I was the last to hold out.

George looked at me and said, "Paul, why haven't you invested your money yet?"

"Because I don't think you've got a viable product," I replied.

"What!" George exclaimed. "You don't think we've got a viable product here!"

"That's right. I don't think you've got a product," I said.

"But we've already put a hundred thousand dollars in this project and we're going to build this thing."

"I still don't think you've got a product," I repeated.

After further discussion with George, I decided I'd better go see John Wilson, who was putting up most of the money for the project.

John was equally surprised. "How can you say that?" he asked. "All the other members of the team say everything is going along fine. What have you been doing?"

"I've been trying to find out what this industry is all about," I replied. "And I've concluded that Dr. Walker's chair is not the design that the dental world wants and that Bill wants this unit made because it's his thing and he's biased towards it. In fact, I found out that almost every dentist has his own chair design. How do you know that this one is right?"

"But it's new and revolutionary," John argued.

"It's not new. It's twelve years old. Every dentist I talked to knew about it. Every one of them said it would never get off the ground. How many of these dentists did you talk to," I asked.

Suddenly John realized that he hadn't talked to anyone but Bill Walker.

"Well, what do you propose we do?" John asked.

"Well, I'm not going to invest my money in this project unless I can come up with an alternate proposal. Otherwise I'm not going to participate in this operation."

John asked if I had an alternate proposal. I told him that I did, but I didn't want to present it yet. Instead I asked that an impartial consulting group be brought in to evaluate both Dr. Walker's design and my own proposed design, before presenting it formally.

After two weeks of study, the consulting group, Carson Laboratories, concurred that my design did make sense and that Dr. Walker's proposed design has some major flaws in it.

In mid-November I formally presented my proposal at a meeting of all the company stockholders. With my formal engineering proposal I had a cardboard mock-up built by Carson Laboratories. This was the first time the stockholders had been given a

formal engineering look at the problem. They accepted the proposal. Dr. Walker stood up before the meeting and claimed that this was really his idea all along and that he just hadn't known how to express his idea in words, shape, or form.

An important aspect of my proposal besides the actual dental unit design was that the two consultants, Mantle and Match, be relieved of their duties. Up to this point, they had been spending money and time looking into Dr. Walker's whims and hadn't been doing what I had wanted done.

It was at this meeting that I committed myself financially to the company. I told them I finally thought we had a good design concept and that it would sell. I also committed myself to having a finished working prototype that would do all the things the proposal said it would by 30 January.

The agreement allowed me to build my own engineering team to produce the unit. The team consisted of myself, Carson Laboratories (as industrial design consultants), a technician I had worked with before and knew I could depend on, and the designer, Harry Anderson, who was changed from part-time to full time. Now I knew all the people on the team and knew that we would be able to work together as a team. (Exhibit IV) This would be essential to meet the January 30th deadline.

On 30 January, according to schedule, the prototype was completed (Exhibit V). The water came out of the cuspidor, the lights went on, the chair went up and down, and did everything it was supposed to do. The next step was to criticize the unit.

To do this we brought in the same dentists who had criticized the individual elements, and let them see all these ideas together in a single unit. They were flabbergasted. They just couldn't believe that after having heard about Dr. Walker's ideas for twelve years his company had finally produced such an amazing unit in such a short time.

Many valuable criticisms were obtained from the dentists who were generally very impressed. Now Dr. Walker became very adamant that no more dentists be allowed to criticize the chair. He claimed that they were messing up our way of thinking and that we shouldn't deviate from our present plan. In fact, he even wanted to start production of the new prototype.

I pointed out that the criticisms had already shown the need for a number of beneficial changes. Bill still couldn't understand that the main function of the prototype was to provide us

with something physical which we could evaluate, criticize and improve upon.

In March, Dr. Walker began disturbing my design procedures again. He would go tell the technician to do things differently from what I had told him. This finally got to be such a problem that I went in to see John Wilson and told him that I was going to quit if he didn't get Dr. Walker off my back and away from the engineering design. I also brought up complaints against George Hack, the president of the company, because of his mismanagement of the cabinet operation. It was three months behind schedule and was only bringing in \$2500 per month where George had projected \$20,000 per month. The result of the confrontation with John was that George Hack was fired and Dr. Walker had his office removed from the plant. I was now totally in charge of the program.

The big problem with the cabinet operation was that it was selling the cabinets exclusively as dental cabinets whereas they could be used for a number of purposes. When Dr. Walker realized that he couldn't have anything else to do with the design of the chair, he went to George Hack and worked with him to design eighty different lines of cabinets. The cost was tremendous. I decided to redirect the efforts of the cabinet operation from just soliciting dental business to selling to anyone who might use cabinets. The cash flow soon increased substantially.

April 1st John Wilson came to me and said, "Paul, if we're going to sell this thing we should get it into some dental shows. There's a big show in Los Angeles at the end of April, but all we have is our crude prototype. Is there any way possible that we can make this show?"

I thought for a second and then I said, "John, I will give you a finished dental unit which looks like it came out of General Motors in twenty-five days, by April 25th.

"That's impossible. It can't be done!" John replied.

But I knew I had a team of people that I could depend on. I knew it would take an amazing amount of coordination but I thought we could do it. I contracted out the parts that couldn't be made in our shop. I worked out a schedule for all the parts and allowed myself two weeks for assembly time and testing, which for a new product was ridiculous.

According to schedule, on April 15th, the parts began to arrive. The last piece to come was the chair which arrived on the 20th. On April 24th, to everyone's amazement, there in front of their

eyes, was a finished working dental unit which did everything it was supposed to do and looked like it had just come off the assembly line (Exhibit VI).

April 25th the chair was shipped to Los Angeles for the Dental Show. It was awarded a prize as the most revolutionary new system to be shown. The Med-Dental Corps from Camp Pendleton called us and said they were putting up a huge laboratory building and they wanted 67 units from us. The chairs sold for \$8500 each. The contract was for \$600,000 total. We got ten more orders as the chair was shown and continued to work without failure in several more dental shows.

At this time the company ran into a severe financial crisis because the credibility of one of its principal investors, Dr. Walker, was in question. The situation was apparently cleared up because I got a call from John Wilson saying that Dr. Walker had met his financial commitment.

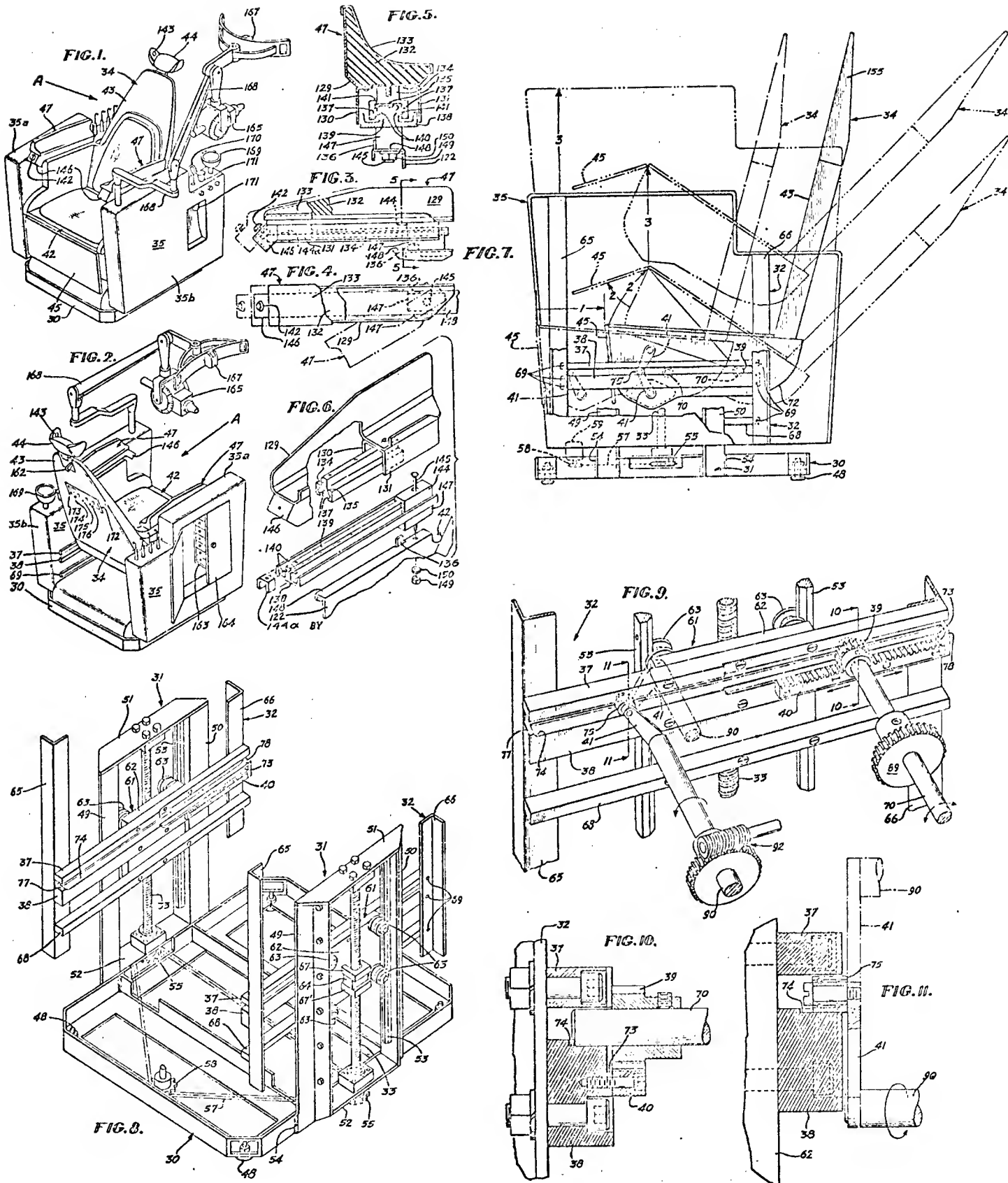
John said, "Congratulations, Paul. You've come through a hellish year but you've proven to me that I made the right choice in the beginning. You did a remarkable job under the most adverse conditions." It was a good feeling.

On 25 May, my 30th birthday, I walked into the plant having been told that I was president of the company, that all the money was in the bank and that everything was proper and according to the book. We had the necessary money for the tooling for the units. We were off and flying. At 10 O'clock that morning I got a call from John Wilson saying "CLOSE THE PLANT DOWN!"!!

Dr. Walker's financial commitment had not been met as indicated. Because of this lack of credibility the other investors would not put in their money.

From an engineering standpoint, the company and its products were an outstanding success, a miracle perhaps. However, since the financial commitments had not been met properly the miracle turned into a disaster. In order to pay off creditors we were forced to sell this thing we had created in a year.

It was a very interesting experience for me, a very maturing experience, one that I'll never be able to forget.



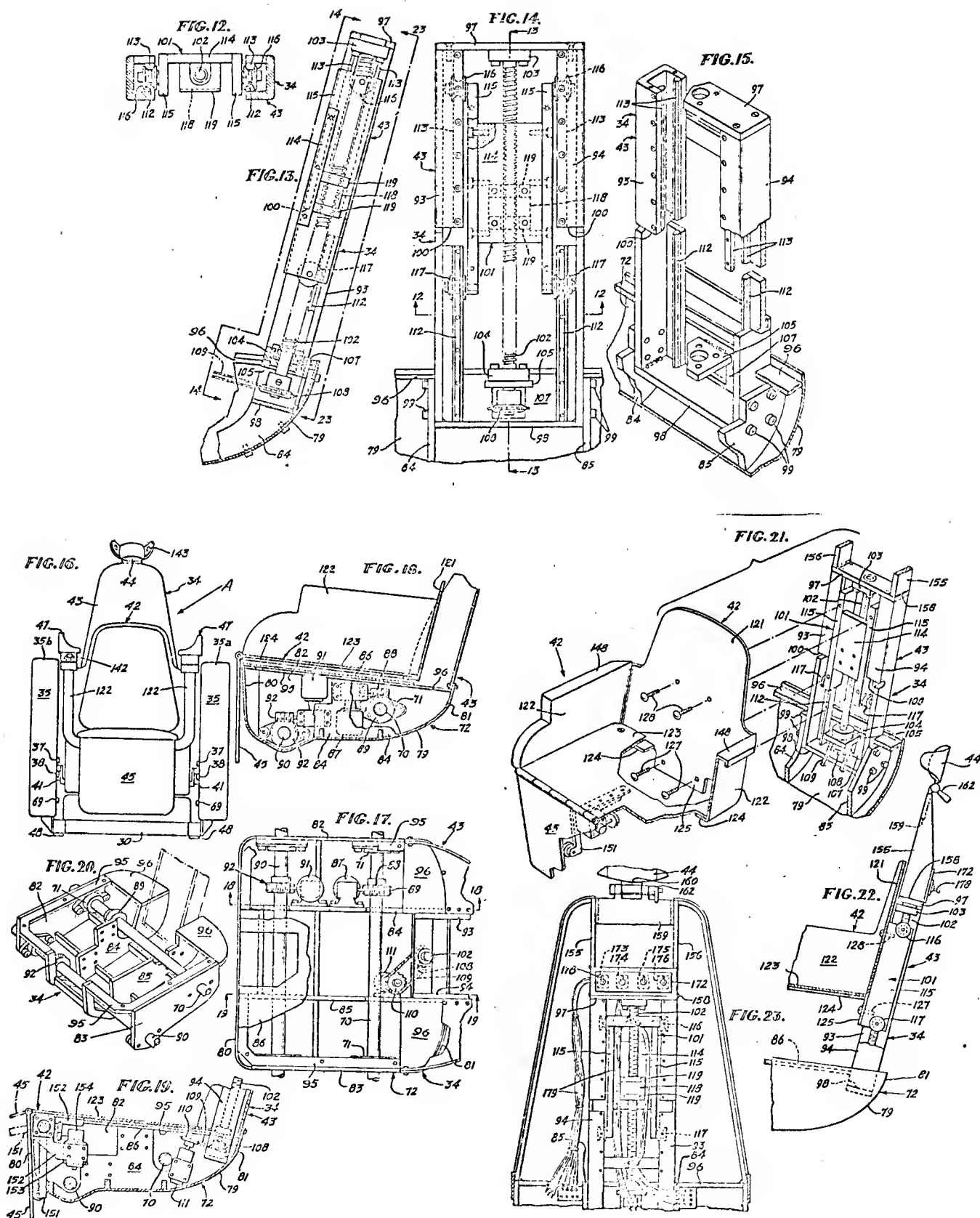


EXHIBIT I
PATENT DRAWING OF DENTAL UNIT

Having thus described the invention, what I claim as new and desire to protect by Letters Patent is defined in the following claims:

1. A dental chair comprising

- (a) a base frame,
- (b) a pair of upright side frames mounted in laterally spaced relation on the base frame,
- (c) a seat support comprising an elongated back portion mounted between the side frames for selective upward, downward, forward and rearward bodily movement, and for forward and rearward tilting movement,
- (d) a head rest mounted on the upper end of the back portion of the seat support,
- (e) a seat member having a short back portion mounted on the back portion of the seat support for travel lengthwise thereof, and
- (f) power drive means for selectively moving the seat support bodily upwardly, downwardly, forwardly and rearwardly, for tilting the seat support between a forward position wherein the back portion thereof is substantially upright and a rearward position wherein the back portion thereof is inclined at a substantial angle from upright condition, and for traversing the seat lengthwise along the back portion of the seat support to position on the head rest the head of a person of any height within a selected maximum and minimum when such person is seated on the seat.

2. A dental chair comprising

- (a) a base frame,
- (b) a pair of upright side frames mounted in laterally spaced relation on the base frame,
- (c) a combined console and track frame mounted for vertical adjustment on each side frame,
- (d) a horizontal track on each console and track frame,
- (e) a seat support comprising an elongated back portion mounted on said tracks for forward and rearward bodily movement therealong, and for forward and rearward tilting movement relative thereto,
- (f) a head rest mounted on the upper end of the back portion of the seat support,
- (g) a seat member having a short back portion mounted on the back portion of the seat support for movement lengthwise thereof, and
- (h) power drive means for selectively moving console and track frames bodily upwardly and downwardly, for moving the seat support forwardly and rearwardly along the tracks, for tilting the seat support between a forward position wherein the back portion thereof is substantially upright, to a rearward position wherein the back portion thereof is inclined at a substantial angle from upright condition, and for moving the seat lengthwise along the back portion of the seat support to position on the head rest the head of a person of any height within a selected maximum and minimum when such person is seated on the seat.

3. A dental chair comprising

- (a) a frame,
- (b) a seat support comprising an elongated back portion mounted on the frame for selective upward, downward, forward and rearward bodily movement, and for forward and rearward tilting movement,
- (c) a head rest mounted on the upper end of the back portion of the seat support,
- (d) a seat member having a back portion substantially shorter than the back portion of the seat support and mounted on the seat support for travel lengthwise of the back thereof, and

- (e) power drive means for selectively moving the seat support bodily upwardly, downwardly, forwardly and rearwardly, for tilting the seat support between a forward position wherein the back portion thereof is substantially upright, and a rearward position wherein the back portion thereof is inclined at a substantial angle from upright condition, and for traversing the seat lengthwise of the back portion of the seat support to position on the head rest the head of a person of any height within a selected maximum and minimum when such person is seated on the seat.

4. A dental chair comprising

- (a) a base,
- (b) a pair of vertically adjustable combined console and track frames mounted in laterally spaced relation on the base,
- (c) a horizontal track on each console and track frame,
- (d) a seat support mounted on said tracks for forward and rearward bodily movement therealong, and for forward and rearward tilting movement relative thereto,
- (e) a head rest mounted at a substantial height on the seat support,
- (f) a seat member having a short back portion mounted on the seat support for movement up and down thereon,
- (g) power drive means for selectively moving the console and track frames bodily upwardly and downwardly, for moving the seat support forwardly and rearwardly along the tracks, for tilting the seat support between a forward position wherein the back portion thereof is substantially upright, to a rearward position wherein the back portion thereof is inclined at a substantial angle from upright condition, and for moving the seat up and down on the seat support to position on the head rest the head of a person of any height within a selected maximum and minimum when such person is seated on the seat.

5. A dental chair comprising

- (a) a base,
- (b) a pair of upright side frames mounted in laterally spaced relation on the base,
- (c) a jack screw mounted vertically in each side frame,
- (d) a combined console and track frame mounted for vertical adjustment on each side frame,
- (e) a threaded member on each console and track frame in threaded engagement with one of the jack screws,
- (f) reversible drive means operatively connected to the jack screws for selectively raising and lowering the console and side frames in unison,
- (g) a horizontal track on each console and track frame,
- (h) an L-shaped seat support comprising an elongated back portion and a lower portion at substantially right angles thereto mounted on said tracks for forward and rearward bodily movement therealong, and for forward and rearward tilting movement relative thereto,
- (i) reversible drive means for selectively moving the seat support along the tracks,
- (j) reversible drive means for tilting the seat support from upright to rearwardly inclined position,
- (k) a head rest mounted on the upper end of the back portion of the seat support,
- (l) a seat member having a short back portion mounted for movement lengthwise along the back portion of the seat support, and
- (m) reversible drive means for selectively moving the seat lengthwise along the back portion of the seat support to position on the head rest the head of a person of any height within a selected maximum and minimum when such person is seated on the seat.

6. A dental chair comprising

- (a) a frame,
- (b) a seat support mounted on the frame for selective upward, downward, forward and rearward bodily movement, and for forward and rearward tilting movement,
- (c) a head rest mounted on the upper end of the seat support,
- (d) a seat member mounted on the seat support for travel upwardly and downwardly thereon, and
- (e) power drive means for selectively moving the seat support bodily upwardly, downwardly, forwardly and rearwardly, for tilting the seat support forwardly and rearwardly, and for elevating and lowering the seat on the seat support to position on the head rest the head of a person of any height within a selected maximum and minimum when such person is seated on the seat.

7. A dental chair comprising

- (a) a frame,
- (b) a pair of side frame elements on the frame and spaced apart to receive a seat support therebetween,
- (c) a track frame mounted for vertical adjustment on each side frame element,
- (d) a horizontal track on the inward side of each track frame,
- (e) a seat support mounted for forward and rearward traversing adjustment on the tracks,
- (f) means for tilting the seat support forwardly and rearwardly to adjusted position, and
- (g) a seat member mounted on the seat support for upward and downward adjustment thereon.

8. A dental chair comprising

- (a) a base,
- (b) a pair of upright side frames mounted in laterally spaced relation on the base,
- (c) a vertical track means in each side frame
- (d) a jack screw mounted vertically in each side frame,
- (e) a combined console and track frame mounted between the side frames and riding on the vertical track means and operatively connected to each jack screw for vertical adjustment thereby,
- (f) a pair of laterally opposite horizontal tracks, one on each console and track frame,
- (g) a seat support comprising an elongated back portion and a lower portion at substantially right angles thereto, rotary support means at the forward and rearward ends of the seat support lower portion and mounted for rolling movement along said tracks,
- (h) reversible drive means for selectively moving the seat support along the tracks,
- (i) means for tilting the seat support from upright to rearwardly inclined position,
- (j) a head rest mounted on the upper end of the back portion of the seat support,
- (k) a seat member mounted for upward and downward movement along the back portion of the seat support, and

- (l) reversible drive means for moving the seat to a selected position along the back portion of the seat support to position on the head rest the head of a person of any height within a selected maximum and minimum when such person is seated on the seat.

9. A dental chair comprising

- (a) a frame,
- (b) a pair of side frame elements on the frame and spaced apart to receive a seat support therebetween,
- (c) a track frame mounted for vertical adjustment on each side frame element,
- (d) a console mounted on each track frame for movement therewith,
- (e) a horizontal track on the inward side of each track frame,
- (f) a seat support mounted for forward and rearward traversing adjustment on the tracks,
- (g) means for tilting the seat support forwardly and rearwardly to adjust position, and
- (h) a seat member mounted on the seat support for upward and downward adjustment thereon.

10. A dental chair comprising

- (a) a frame,
- (b) a pair of side frame elements on the frame and spaced apart to receive a seat support therebetween,
- (c) a track frame mounted for vertical adjustment on each side frame element,
- (d) a horizontal track on the inward side of each track frame,
- (e) an L-shaped seat support one leg thereof comprising an upwardly extending back portion and the other leg thereof extending forwardly from the lower end of the back portion,
- (f) rotary means mounted at the forward and rearward portions of said other leg of the seat support and operatively engaging the tracks for supporting the seat support for forward and rearward traversing adjustment on the tracks,
- (g) means for tilting the seat support forwardly and rearwardly to adjusted position, and
- (h) a seat member mounted on the seat support for upward and downward adjustment thereon.

11. An arrangement according to claim 10 wherein the seat tilting means comprises a pair of power driven levers, mounted one at each side of the forward portion of said other leg of the seat support, each lever having journal support means at its free end upon which the rotary means at the forward portion of said other leg of the seat support are journaled for free rolling movement along their respective tracks.



EXHIBIT III
PROTOTYPE OF DENTAL UNIT

FACSIMILE OF LETTER FROM LARSON LABORATORIES

December 5, 1969.

Mr. Paul Hait
Walker Dental Supplies Inc.,
Palo Alto, California.

Dear Paul:

The attached information is supplied in answer to your request for a plan whereby the efforts of Carson Laboratories can be integrated into the next stage of development of the WDS Dental System.

We see the development as an iterative process, the purpose of which is to verify fundamentals in the most expeditious and economical manner before proceeding with refinements. (To put it another way, the consequence of a single-step process could easily be the creation of some very elegant garbage.) Each phase of the program should be planned to result in a physical approximation of the product which provides information upon which to evolve the succeeding phase, culminating in the final prototype. We propose that there be three such phases, which we call Breadboard, Laboratory Prototype, and Production Prototype respectively.

The Breadboard Phase is defined as a crude system which is constructed insofar as possible from currently available hardware components and which permits operational evaluation of the basic mechanical and human-engineering factors in the shortest time and with the least financial risk. In other words: ugly, probably; but functional, certainly.

The Laboratory Prototype Phase is based upon feedback from the Breadboard and upon substantially increased consideration for appearance and producibility. It should be fairly close to the mark in all respects, but not quite there yet.

The Production Prototype Phase is primarily concerned with minor mechanical de-bugging and concentrated effort on appearance details and manufacturing economy. The finished prototype should insofar as possible be identical to subsequent production units.

It is our understanding that WDS desires Carson Laboratories to concentrate its effort largely upon human engineering and appearance, thus allowing WDS to maximize its input of mechanical engineering, drafting, and design implementation. With this in mind, we have outlined the major division of responsibilities which are critical to the fee proposal and the development format.

Division of Responsibilities:

Carson Laboratories

1. First design layout for system (exterior dimensions, locations, etc.) & sketches for updating 2nd & 3rd generation layouts.

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2. Detailed appearance sketches as required for all modules.
3. Appearance modeling of seat and procurement of fiberglass molds.
4. Human factors and appearance evaluation of breadboard and 2nd and 3rd prototypes.
5. Graphic design and camera ready art.
6. Color selection for hard prototype (1 color combination).
7. H.F. and appearance evaluation of purchased components.

Walker Dental Supplies Inc.

1. All drafting and part drawings (including up-dating design layout).
2. All vendor contact.
3. All part procurement (except for fiberglass).
4. Fabrication (except appearance modeling of seat form, but including seat breadboard and back for model).
5. Assembly.
6. Function and life testing.

Dual responsibilities

Conceptual design, analysis, evaluation of system and components.

Development Format

The Breadboard Phase is based upon a system master design layout and a series of detailed design layouts representing the individual system modules. Carson Laboratories expects to provide all of these, except for the life-unit and fiber optics light unit. For the succeeding phases, we shall provide information, sketches, etc. which will allow WDS personnel to upgrade the design layouts. Our individual design effort, in this connection, will ordinarily be preceded by timely, informal, short conferences with WDS personnel to insure the exploration of a variety of reasonable mechanical alternatives.

We shall participate jointly with WDS personnel in the evaluation of each phase as its conclusion, our emphasis, again, being upon human engineering and appearance.

During the latter two phases, it is also appropriate that Carson Laboratories fabricate or model certain items wherein delineation of form would be otherwise difficult.

Following is a detailed procedure to be used during the breadboard phase. Responsibilities are itemized at right. The sequence following step 4 is not critical.

The fee schedule and target completion dates for the Breadboard Phase are as follows. Upon completion sufficient information will be available to detail succeeding phases in a similar manner.

	<u>Hours</u>	<u>Cost</u>	<u>Completion Date</u>
1. 1/4-scale system design layout (including dimensions, ranges, module locations & inter- distances)	44	1320	15 Dec.
2. Seat Assembly	40	1110	31 Dec.
3. Dentist's Instrument Pack	16	480	7 Jan.
4. Tray & Support	26	780	19 Jan.
5. D.A. Unit	23	690	19 Jan.
6. Cuspidor	8	240	19 Jan.
7. H.F. Testing, Evaluation and Documentation	40	1200	9 Feb.
8. Estimate & Program Planning	<u>24</u>	<u>720</u>	
TOTAL	221	\$6540	

EXHIBIT IV

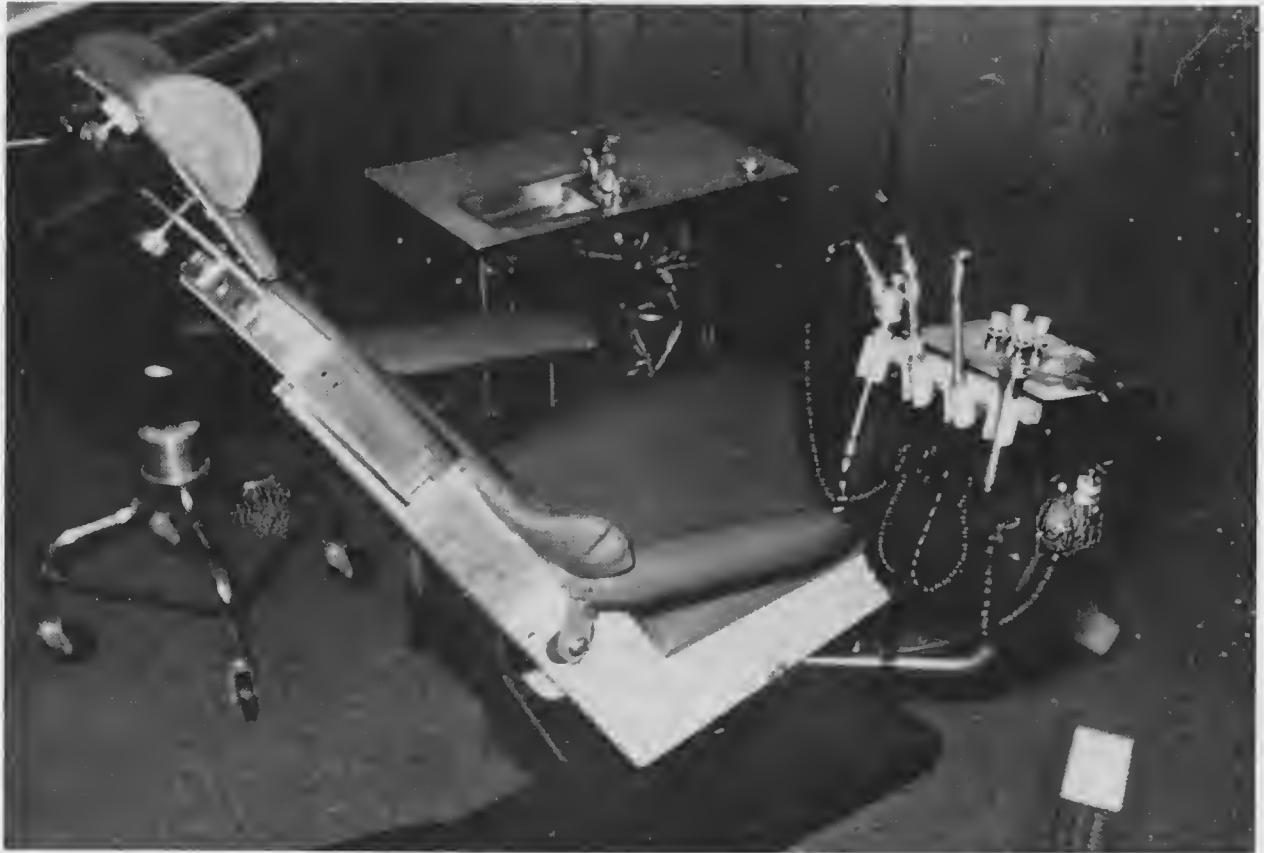


EXHIBIT V
WORKING PROTOTYPE OF REVISED DENTAL UNIT

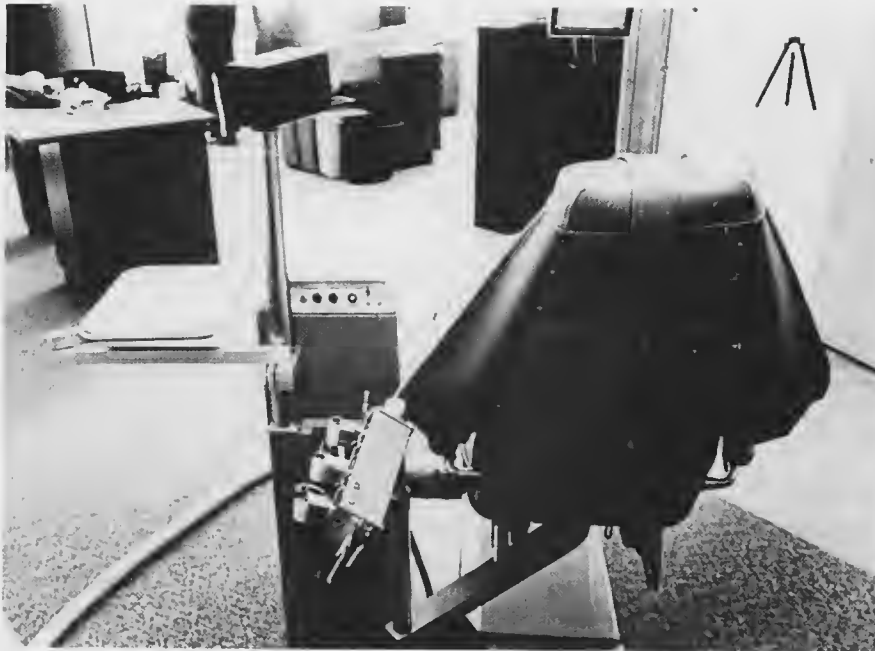


EXHIBIT VI
DISPLAY PROTOTYPE DENTAL UNIT